INSIDE: A STREAM'S BEST FRIEND TURNS 50

Montana Outdoors

MONTANA FISH, WILDLIFE & PARKS | $4.50

JULY-AUGUST 2025

NOT A DOG'S CHANCE

How to protect your pooch from rattlers

IN THIS ISSUE:

BILLION-BIRD KILLER YOU CAN HELP FIX

HOW TO COOK MOUTH-WATERING WHITEFISH

PUTTING A FULL NELSON ON MT'S FISH RECORDS

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HEY, THAT'S NOT MONTANA
Pilot Peak, a revered landmark on the Beartooth Highway, discharges a rare ground-to-cloud strike on a summer evening. Though Pilot and its neighbor Index Peak (on right) lie just inside the border of Wyoming, the ridge on the right includes a slice of Montana, enough to justify running this impressive image. See more stunning weather shots starting on page 40. Photo by Carter Gowl.

COVER Learn how to help protect your dog from rattlesnakes beginning on page 26. Photo by Craig Miller.

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LETTERS

Sharing the love

I love this magazine! Every issue manages to amaze me. I particularly enjoyed Tom Dickson's Sketchbook column ("We Made It," May-June 2025). My heartfelt thanks to each of you involved in the production of this beautiful magazine. I just gave a gift subscription to my sister, which I hope can begin with the May-June issue. Thank you for all you do!

Deanne Kendrick
Missoula

Editor replies: Thanks for the kind words. This magazine is a labor of love, and we put each issue together hoping every reader will enjoy it as much as you do. We also love hearing about our readers giving gift subscriptions. We're proud to offer a year's subscription (six issues) for just $15. Could be we're biased, but we feel it's a lot for a little money.

While enjoying a field trip to Bannack State Park in early May, eighth-graders from Whitefish posed for this photo expressing their enthusiasm for the May-June 2024 special edition of *Montana Outdoors*, A Driver's Guide to Montana's Working Lands.

Priceless

Just a note to congratulate Tom Dickson on his retirement and his spectacular contributions to (and leadership of) *Montana Outdoors*. His humor, humility, knowledge, and willingness to share are truly unique.

Tom Schenkenberg
Salt Lake City, Utah

Editor replies: We most certainly agree and are thrilled Tom will still be contributing as a freelancer with his Sketchbook column and recipes. He'll also be writing the occasional feature story as well. Don't miss his "Stream Savers" article on page 32 of this very issue. ■

We welcome all your comments, letters, feedback, and questions. Write to us at Montana Outdoors, *P.O. Box 200701, Helena, MT 59620-0701 or paul.queneau@mt.gov.*

PAST PERSPECTIVES

Excerpts from the FWP archive

If Montanans are worried about housing sprawl these days, some residents were downright apoplectic a half-century ago, if the January-February 1974 issue of *Montana Outdoors* is any indication.

In a 10-page editorial, editor Bill Schneider called the state's rapid subdivision—breaking large tracts of land into smaller parcels for housing—a "conservation crisis." "I want very much to tell you how fast Montana's landscape is disappearing beneath concrete, homes, lawns, and roads—how fast the public is losing access to prime recreation areas—how seriously our streams and lakes are being polluted and how much wildlife habitat is being lost," he wrote.

Schneider quoted a public health engineer at the Montana Department of Health and Environmental Sciences, Wilbur Aikin, who said many developers were frantically selling parcels before much-feared new state regulations protecting drinking water, wildlife habitat, and rivers took effect. "This business of subdividing land is almost at a level of hysteria," Aikin said.

Schneider added that "buyers—many of them out-of-staters—are lured by advertisements featuring a hunting and fishing paradise, pure mountain streams, forest-ringed lakes, scenic views and unpolluted, uncrowded living conditions. [But] the ads don't tell buyers that when they buy their piece of Montana, they automatically contribute to the demise of what they seek."

Montana did not regulate development to the extent Schneider wanted, but the Legislature did add protections for habitat and water, including the 1975 Streambed and Land Preservation Act, whose golden anniversary we highlight in this issue on page 32. ■

Flathead Lake Whitefish with Shallots and White Wine

By Tom Dickson | Preparation time: 2 minutes | Cooking time: 15 minutes | Serves 2-3

SHUTTERSTOCK

Some of the best fish I've eaten recently were Flathead Lake lake whitefish fillets from our local grocery store. (And no, "Lake lake" is not a typo. The fish are lake whitefish from Flathead Lake.) This is how I "caught" those fish:

For hundreds of years, native bull trout in Flathead Lake were consumed by the region's Salish, Flathead, and Kootenai tribes. The fish were netted, speared, and trapped in weirs during fall spawning runs.

But after the state planted *Mysis* shrimp in nearby lakes to boost numbers of non-native kokanee salmon in the late 1960s, the shrimp escaped into nearby Flathead Lake in the early 1980s. Juvenile lake trout, a species introduced from the Great Lakes to Flathead in 1905, thrived on the tiny non-native crustaceans. That allowed the lake trout population to explode and eat up small kokanee salmon, depriving bull trout of a major food source.

Bull trout numbers tanked. By 1998, the species was listed as threatened under the Endangered Species Act.

FWP and the Confederated Salish and Kootenai Tribes (CSKT) co-manage the fishery of Flathead Lake, half of which is on the Flathead Indian Reservation. As part of a cooperative effort to reduce the lake trout population and increase numbers of bull trout and native westslope cutthroat (also on the lake trout's menu), the CSKT has begun gillnetting and selling lake trout commercially. Lake whitefish, which live in deep water with lakers, are part of that commercial harvest.

The bone-free fillets are found in the frozen fish section of grocery stores in two dozen towns across Montana (see nativefishkeepers.org). ■

—Tom Dickson is the previous editor of Montana Outdoors.

Find more recipes at bit.ly/TastingMontana ▶

INGREDIENTS

1 lb. Flathead Lake lake whitefish fillets, thawed
½ c. each of flour and panko bread crumbs
1 egg, beaten and combined with 1 T. water
1 small shallot, diced
½ c. dry white wine
Olive oil and butter

DIRECTIONS

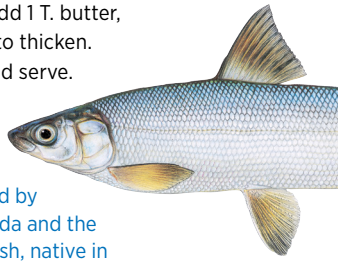
Place flour and bread crumbs in separate plates. Season flour with salt and pepper. Place egg-water mixture in a third plate.

Heat skillet on medium-high.
Add 2. T. butter and 2 T. olive oil.

As oil and butter heat, dredge fillets in flour, then egg-water mixture, then coat with bread crumbs. When the butter stops foaming and begins to brown, add fillets. Cook 5 minutes on each side or until coating is golden brown. Remove to a paper towel. Repeat with more oil and butter if you have additional fillets.

Once the fish is done, add 2 T. butter to the hot pan and then the diced shallots, stirring as they brown. After 5 minutes, add white wine, scrape up the brown bits on the pan bottom, and cook until reduced by half. Salt and pepper to taste.

Remove from heat and add 1 T. butter, stirring it into the sauce to thicken. Pour sauce over fillets and serve.



YUM, WHITEFISH!

Lake whitefish produce a sweet, white fillet prized by anglers throughout Canada and the Great Lakes states. The fish, native in Montana only in St. Mary Lake but introduced to several other waters, are also considered great for smoking.

Another delicious salmonid—when taken from cold water—is the mountain whitefish, which is caught in trout rivers throughout western Montana.

Mountain whitefish are commonly disparaged by anglers hoping to catch trout, often considered a more "worthy" fish. Yet whitefish fight hard and can reach up to 5 pounds (though 1- to 2-pounders are more common). Part of the prejudice against mountain whitefish comes from the species' lipped mouth, a feature many anglers find off-putting and similar to those on carp and suckers, species also deemed undesirable. Mountain whitefish fillets can turn mushy when the fish are taken from warmer waters in summer. ■

Lessons from the Legislature

The 69th Montana Legislature began its 90-day session in January just a few short weeks after I became director of Montana Fish, Wildlife & Parks. It proved to be a great (if speedy) introduction to our complex agency and a superb chance to get to know many of FWP's staff.

This biennial assembly is always a heavy lift for our agency. Staffers spent long days at the capitol as we explained our budget requests and testified on 80 bills focused on fish, wildlife, or state parks.

As you can imagine, this was not the ideal time to be an FWP newbie, but I jumped into the trenches and locked arms with our staff. I benefited enormously from their depth of knowledge and expertise, and thanks in large part to their efforts, FWP left the session with many important bills headed for the governor's desk and with our budget in good shape. Our successes reflect the value Montanans put on FWP's work and their investment in the resources we oversee.

The Montana State Capitol in Helena.

Here are some highlights of the legislative session:

▶ **A bill to place the roughly $10 million of conservation funding provided by marijuana sales taxes into a Habitat Legacy account.** Of those funds, 75 percent will stay devoted to the Habitat Montana Program and state water projects, 20 percent will now go to the Wildlife Habitat Improvement Program, and the remaining 5 percent will support a fund focused on reducing wildlife-vehicle collisions on Montana's highways.

▶ **Several bills passed that boost the Block Management Area (BMA) Program,** including one that will pay individual landowners up to $25,000 in BMA funds to provide public access to isolated state and federal tracts within their private land. Another gives FWP clear authority to fine those breaking BMA rules and restrict them from using those areas in the future. A third bill raised nonresident hunters' base license fees from $15 to $50, which should provide the BMA program an additional $2.5 million if license sales stay at their current level.

▶ **A bill raised license fees for stocking private fishing ponds** (which hadn't increased since 1945) from $10 to $600 for new pond applications and $250 for renewals and license transfers. Funds from this will help FWP cover the cost of the licensing review process, and fish removals for aquatic invasive species.

▶ **A bill creating a Trapper Apprentice Program**, which expands FWP's apprentice hunting certificate to include trapping. This allows those age 10 or older to hunt (and now trap as well) for up to two years before completing a hunting or trapping education course as long as they're accompanied by a certified mentor.

We also learned lessons from the many bills that didn't pass. For instance, it was clear from the number of bills focused on wolves that Montanans are concerned that this predator's numbers are too high. We will keep that in mind as the Fish and Wildlife Commission sets wolf harvest quotas this August.

One thing that impressed me during the session was the broad public and legislative support for this agency. FWP oversees many regulations, rules, and laws, and legislators on both sides of the aisle were great about reaching out to FWP staff when they had questions. Right from the start, I assured legislators that my staff and I would be completely transparent regarding the department's budget, policies, and plans. For instance, when we received questions about why FWP needed to add law enforcement, research, communication, and education staff, we explained clearly how our request reflects increasing demand from the growing number of people traveling to and moving to Montana to enjoy our wildlife, fish, parks, public lands, rivers, streams, and lakes. And how some positions will help us find ways to keep common wildlife species common so they don't become listed under the Endangered Species Act.

We also heard from legislators that we need to study how increased use by nonresident hunters and others may cause crowding that can negatively affect Montanans' outdoor activities (such as upland bird hunting opportunities), whether residents are happy with their experiences, and how FWP can accommodate the growing number of outdoor recreationists and keep more people engaged in management planning.

Certainly 2027 is still a long way off. But between now and then, we will do all we can to gather information that helps legislators in their decision-making during the next legislative session, and allows FWP to remain responsive to what Montanans want and need.

—**Christy Clark,** *Director, Montana Fish, Wildlife & Parks*

KEVIN LEAGUE

LAUREN KARNOPP / FWP

DISEASE DETECTIVE

DR. EMILY ALMBERG
Wildlife disease ecologist, Bozeman

I GREW UP IN CHICAGO where wildlife wasn't easy to find, but my family took frequent trips to visit my grandmother's farm in central Illinois, where she had a half-acre of native prairie that attracted a variety of birds, insects, and other critters. I forged a bond with wildlife there, and by college I wanted to pursue primatology. But knowing that career path would take me too far from home and family, I started looking at other options.

After earning my undergraduate degree in biology I began volunteering for the Yellowstone Wolf Project tracking wolves, and I quickly fell in love with the West and its wildlife. Then the inflection point for my career came after an unknown sickness broke out among Yellowstone's wolves and I witnessed pup after pup perish in front of their dens. I'd retrieve their little carcasses and help with some basic epidemiological work as we searched for what was killing them. We eventually learned it was canine distemper virus, and I grew ever more fascinated by how diseases can affect wildlife.

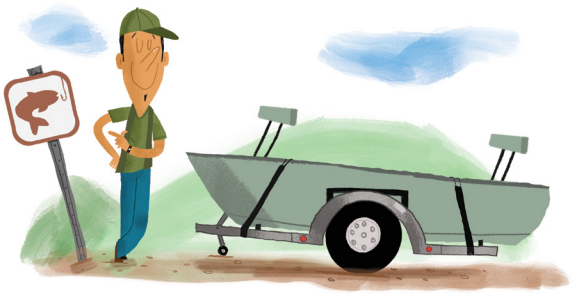
I went back to get my master's at the University of Minnesota, studying viral infections in wolves, coyotes, and foxes with professor David Mech, and later did my PhD at Penn State focusing on sarcoptic mange in Yellowstone's wolves. Just as that wrapped up, a position opened up at FWP's wildlife health program with Jennifer Ramsey, which I felt so lucky to get. I now work on chronic wasting disease, brucellosis, respiratory disease in wild sheep and goats, and white nose syndrome in bats. I love working on a wide assortment of species with such a committed and passionate group of folks, while hopefully providing insights and information that are useful for managing those species while I'm at it.

SNAPSHOT

Photographer **Anthony Pavkovich** had hiked deep into the Absaroka-Beartooth Wilderness above Red Lodge when he took this photo of ultra-runner Nate Bender's parents crossing West Fork Rock Creek below Whitetail Peak. Bender, a Missoula native, was busy pioneering a route that linked the 27 peaks in Montana over 12,000 feet, all in the Beartooth Mountains, a trek of more than 100 miles that he completed in four days. "I hiked in to support him and capture media of his effort," says Pavkovich. "Nate's folks also packed in by horse with food and a change of clothes to provide a mid-route resupply just below Sundance Pass. I feel this image captures the sense of peace I frequently found in the Beartooths, one of the best backcountry treasures you can find in the Lower 48." ■

BEARING DOWN ON BLACK BEARS

In 2023, FWP launched a research project to gain a better understanding of density and abundance of black bears across the state. During that first year, biologists captured and placed GPS collars on 31 black bears, including the one photographed here in the Bitterroot Mountains near Missoula. Biologists also erected 64 hair-collecting traps that snagged dozens of DNA samples from grizzlies and almost 900 samples from black bears. This work expanded to the Kalispell area in 2024, and is focused on the Little Belt and Gravelly ranges for 2025. To see how biologists research black bears, scan the QR code at left or visit **youtu.be/84SQPFog4SU.** ■ PHOTO BY LAUREN KARNOPP / MONTANA FWP



335 Number of FWP-owned and -managed fishing access sites across Montana.

New migratory bird stamp announced

Last year, after a 22-year absence, Montana reinstated a migratory bird stamp. The winning artwork for 2025, by Florida artist John Nelson Harris, was chosen from dozens of submissions. This marks his second consecutive win in the contest, which aims to promote awareness of wetland conservation. This year, all hunters who purchase a stamp will receive an email offering them a sticker sheet featuring the artwork.

But it's not only for hunters—anyone who wants to support wetland conservation can purchase a sticker sheet through Montana Audubon or Montana's Outdoor Legacy Foundation. This year's contest had generous support from Montana's Outdoor Legacy Foundation, Montana Audubon, and Ducks Unlimited. For more information about the contest and to view the submissions, visit **fwp.mt.gov/migratory-bird-stamp** ■

Sheep hunting is closed in HD 622 due a drastic plunge in population.

WILDLIFE DISEASE

Breaks bighorns suffer die-off

In late April, FWP shared the disappointing news that two bighorn rams from Hunting District 622 on the north side of the Missouri River Breaks had tested positive for a microorganism that can cause pneumonia.

A hunter had harvested one of the sheep the previous fall. The second ram died during spring survey efforts by FWP and had visible evidence of pneumonia in its lungs. Both rams tested positive for *Mycoplasma ovipneumoniae*, or *M. ovi.*

M. ovi can facilitate infections by other bacteria, leading to pneumonia outbreaks in bighorn sheep herds. FWP has documented such outbreaks and subsequent population declines in other bighorn sheep herds in Montana.

"Pneumonia can cause all-age die-offs and chronic infections in adult and lamb bighorn sheep. This can persist for many years within a herd," says Dr. Jennifer Ramsey, FWP wildlife veterinarian. "This situation is very complicated and not completely understood because we also have robust herds infected with *M. ovi* and other pneumonia-causing bacteria, and we do not see population declines."

Concerns over bighorn sheep populations in the hunting district have mounted over the past two years as biologists noted declining numbers during aerial counts and hunters reported seeing sick sheep and a shrinking herd within the hunting district.

Although other respiratory tract bacteria had been found in HD 622's bighorn sheep as part of ongoing health monitoring since 2016, *M. ovi* was not among them. FWP is continuing to look at the strain of *M. ovi* found in the rams to see if it offers further information about the infection.

"This is disappointing news for this herd, which has been one of our strongest in recent years," says Drew Henry, northeastern Montana FWP regional supervisor.

In early April, the Montana Fish and Wildlife Commission closed bighorn sheep hunting in HD 622 due to the dramatic loss of population.

FWP will continue to monitor the few remaining sheep in the hunting district. Members of the public recreating in the area are encouraged to report sheep sightings to the Glasgow FWP office at (406) 228-3700. ■

FROM TOP LEFT: MIKE MORAN ILLUSTRATION; KEN ARCHER; ARTWORK BY JOHN NELSON HARRIS

FISHING RESEARCH

Do your part (and earn prizes) by reporting tagged trout

FWP staff plan to tag fish each year for the next three years.

Are you planning to fish the Ruby, Beaverhead, Big Hole, or Madison rivers this year? If so, Montana Fish, Wildlife & Parks needs your help. You can even earn cash rewards and other prizes.

FWP staff have tagged trout in these rivers as part of an important research effort to better understand fish population declines and health concerns.

The tags are on the top of fish near the dorsal fin. Use clippers to carefully remove the tag as close to the skin as possible while minimizing handling time out of the water. The next step is to submit a report for each tagged fish including tag number, date, location, condition of the fish, gear type used, and whether you released or kept the fish.

Note that some trout may still be carrying less-noticeable tags from last year that may be covered in a thin film of algae.

As for rewards, yellow tag reports are each worth $100. Anglers who report blue tags will be entered into regular drawings for gear and fishing trips. These drawings have already begun this year, and they will continue over the coming months.

Anglers and other river recreationists may also meet staff from Montana State University (MSU) while on the river. These creel clerks will be conducting interviews as part of the research effort.

Reporting these tags is critical to helping researchers assess what's hampering trout survival in the upper Jefferson River basin. Now in its second year, this research is part of a collaboration between FWP and MSU on three PhD studies looking at causes of mortality for adult trout, how tributaries contribute to mainstem trout populations, and ways to enhance proactive fish health monitoring.

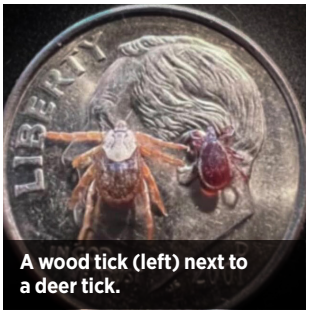
FWP staff tagged nearly 12,000 trout last year, and anglers have sent almost 1,300 reports of catching the tagged trout.

"This is a great chance to take an active part in research to benefit the fishery," says FWP regional fisheries program manager Mike Duncan. "We need your help. Please report the tagged fish you catch."

To report a tagged fish from these four rivers, visit mtcfru.org/msutag or call 406-994-2384. A how-to video on this process is available on FWP's website. ■

DISEASE VECTORS

Deer ticks confirmed in two Montana counties



A wood tick (left) next to a deer tick.

This spring, Montana joined the growing list of unlucky states that host the black-legged tick, also called the deer tick and best known for carrying Lyme disease.

The tick first turned up in Dawson County in eastern Montana on a hunter's dog. Then a second was detected by tick surveillance crews in northeastern Montana's Sheridan County, including the town of Plentywood. No larger than a sesame seed, black-legged ticks are notoriously hard to spot due to their tiny size.

Until now, ticks found in Montana were not known to carry Lyme disease, but public health officials worry that may soon change. "We can have a situation where these are just what I call 'one-off' ticks, meaning they maybe were flown in on a bird from another state, landed, and couldn't survive here long term, or we could have a population of ticks actively reproducing and currently present that would then introduce that greater risk," says Devon Cozart, an epidemiologist with the Montana Department of Public Health and Human Services (DPHHS).

Right now, all that is certain is that the risk of encountering a black-legged tick may be higher in Dawson and Sheridan counties. Cozart says current research indicates ticks must be attached to a person for at least 24 hours before they can transmit Lyme disease, which not all deer ticks carry. Be sure to check yourself and your pets for ticks right after you've been outdoors. ■

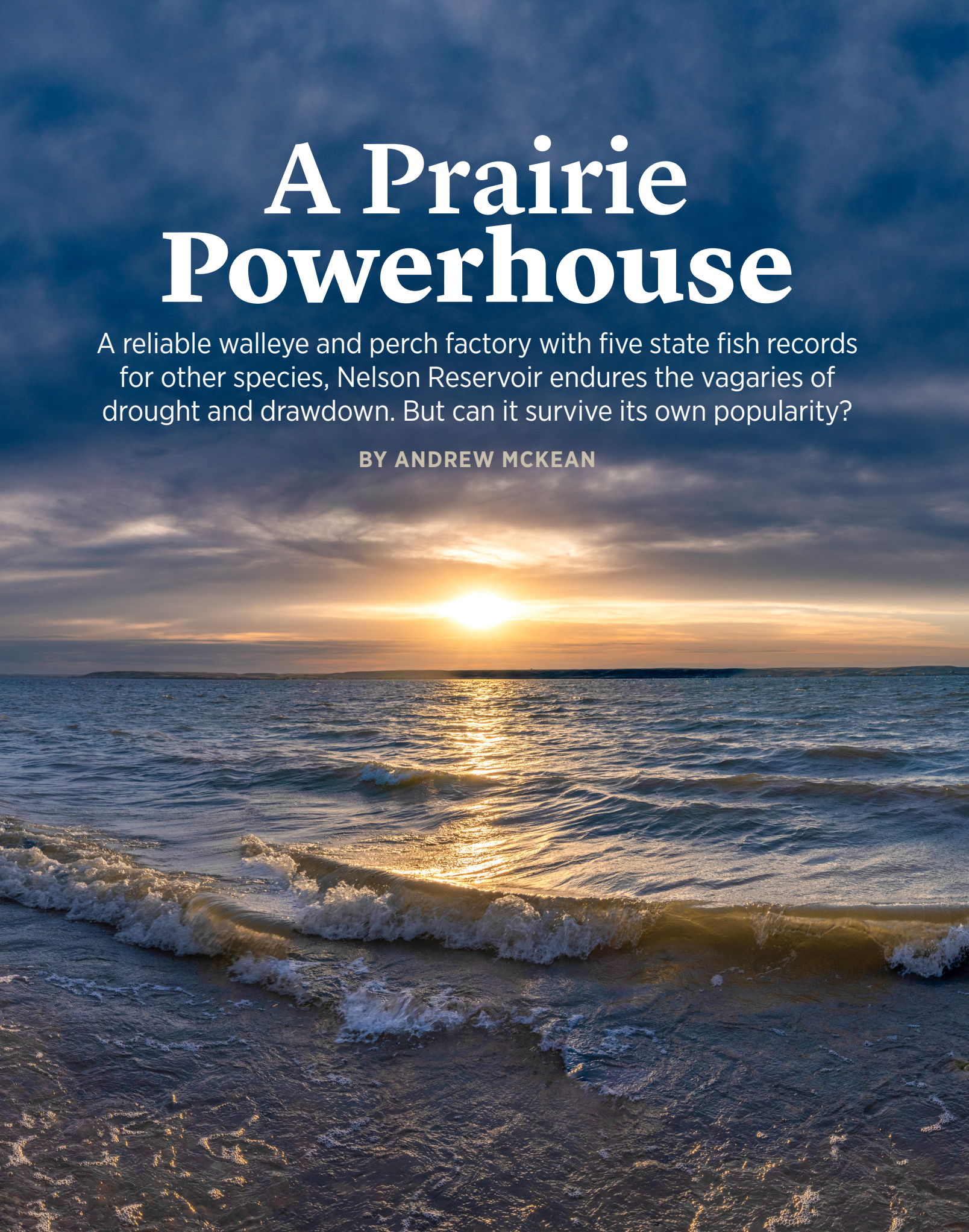
FROM TOP: LAUREN KARNOPP/ FWP; TOM SCHWAN

STAYING PUT As an "off-stream" reservoir, Nelson holds its water—and small fish, zooplankton, and aquatic vegetation—for several years at a time. That's unlike "run-of-the-river" reservoirs like Fresno, which may be flushed out two or three times annually, washing away tiny fish and vital fish habitat and nutrients. PHOTO BY SEAN HEAVEY

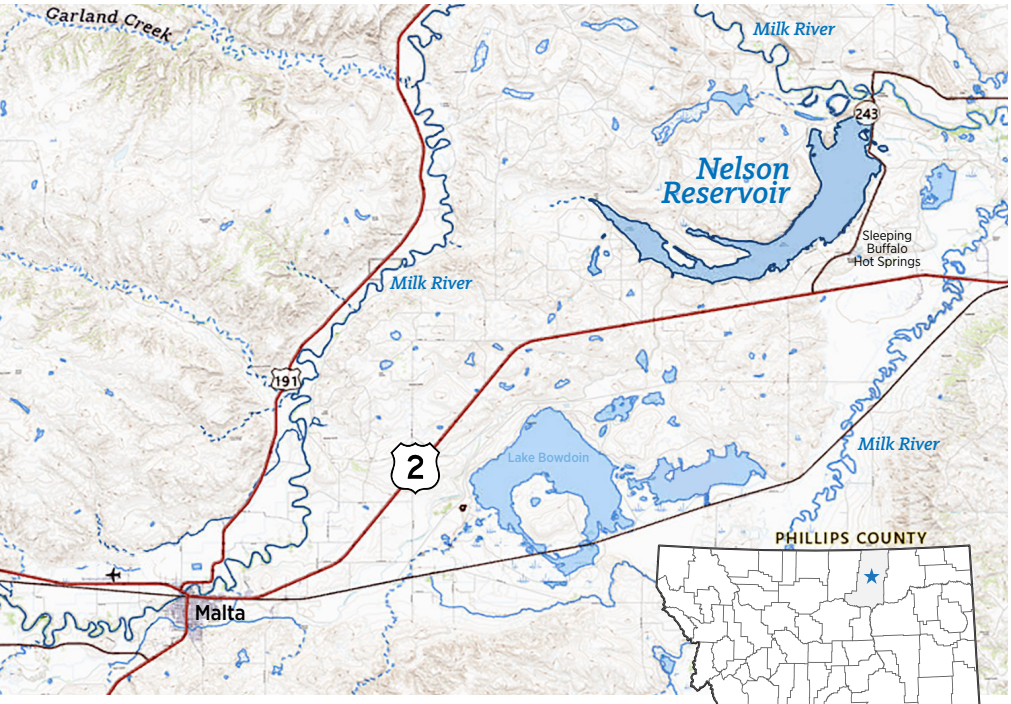
A Prairie Powerhouse

A reliable walleye and perch factory with five state fish records for other species, Nelson Reservoir endures the vagaries of drought and drawdown. But can it survive its own popularity?

BY ANDREW MCKEAN



BUFFALO BRUISER In 2023, angler Debbie Henry landed a 40-pound smallmouth buffalo, the current state record, at Nelson Reservoir following a lengthy fight.



FULL NELSON Northeast of Malta, Nelson Reservoir gets its water from a canal system that connects to the Milk River. Since Nelson's outlet structures are relatively tall, even when it's full and spilling water, it can drop only about 16 feet from full pool.

Steady, productive Nelson Reservoir

owes its ability to produce record-class fish decade after decade to the first and second laws of fisheries management: Add water, then retain it.

While neighboring northeastern Montana fisheries endure a boom-and-bust cycle of fluctuating water levels, Nelson was designed as an off-stream irrigation storage reservoir with a century-old "dam" (in this case a series of dikes) that resists droughts and drawdowns, helping it retain its title as one of Montana's most consistent and diverse fishing destinations. In a part of the state defined by arid conditions and prolonged droughts, that's a rare trait indeed.

This prairie reservoir northeast of Malta holds five current state-record fish titles, including a trio of 40-plus pounders: common carp, largemouth buffalo, and smallmouth buffalo, plus goldeye (3.18 pounds) and white sucker (5.33 pounds). Nelson has also held previous state records for channel catfish and northern pike.

These outsize fish catch the attention of trophy hunters, but for thousands of anglers, Nelson's greater appeal is its consistency and its ability to produce a limit of perch or an eating-size walleye or two on most outings. Yet these anglers, especially those who have fished the remote, windy, and buggy Nelson for decades, say the reservoir's future productivity may hinge on its ability to weather a new challenge: rising popularity as a destination fishery.

And that popularity depends on whether the reservoir, along with all the fisheries, fields, and folks that depend on the Milk River, can limp through this summer when flows may be drawn down for irrigation.

Andrew McKean is the hunting editor for Outdoor Life *and a frequent contributor to* Montana Outdoors. *He lives on a ranch outside of Glasgow.*

CLOCKWISE FROM TOP LEFT: DEBBIE HENRY; GAIA GPS; CARROLL VAN WEST; FWP

The Milk River near Malta.

MULISH RESOLVE With blood, sweat, and mules, Heinrich Hans Nelson built Nelson Reservoir to deliver snowmelt from Glacier National Park to the parched prairie.

"A key to Nelson's productivity is water retention—the length of time that water stays in the reservoir."

HOMESTEAD-ERA HYDROLOGY

Nelson remains consistently productive partly because of how it gets its water, but even more critically, how it keeps it, says Cody Nagel, Montana Fish, Wildlife & Parks' Hi-Line fisheries biologist.

"The important thing to know about Nelson is that it's an off-stream irrigation storage reservoir," Nagel says of the lake, which fills a prairie vale just north of U.S. Highway 2. "Its water is delivered via a canal system that diverts some Milk River flows upstream of Malta, but Nelson's outlet structures are relatively high, meaning that even when it's spilling water, it can only drop about 16 feet from full pool. That creates a natural conservation pool that retains something like 30 feet of depth in Nelson. Even though there may be rights to that water [below the outlet], nobody can get to it."

Both the supply canal and the outlet structure are the work of Nelson's namesake, a determined Dane whose 100-mule teams began building the reservoir's rock-and-earth dam in 1908, just as homesteaders were filling in the map along northern Montana's Hi-Line. Back then, as now, irrigation was a lifeline to prosperity, and Heinrich Hans Nelson and his human and equine crews fashioned Nelson Reservoir as part of a large and ambitious hydraulic system to send snowmelt from Glacier National Park to the parched prairie.

Well over a century on, the aqueduct-and-reservoir network still functions as intended. Through a series of irrigation districts that starts near Havre and extends all the way downstream to Nashua, the Milk River valley has some 120,000 acres under irrigation, powering the economies of towns like Chinook, Malta, and Glasgow and providing drinking water to many of those municipalities. Importantly for fish and fisheries, the reservoir system also has kept water in the river during seasons when flows slowed to a trickle.

This water-distribution system has been in the news recently, as the 110-year-old tunnels and canals that siphon water from the St. Mary River breached last summer. The failure of the diversion that redirects water from Glacier Park essentially turned off the tap to the Milk River, sending irrigators scrambling for emergency funding to repair the infrastructure.

The Milk River and its water impoundments will surely be affected by a shortage of water this spring and summer. But Nelson Reservoir will likely chug along relatively unaffected, says FWP's Nagel.

That's because approximately 120 years ago, H.H. Nelson's engineering foresight created a rarity on the Northern Plains: a drought- and catastrophe-resistant water storage facility.

While both Fort Peck Reservoir on the Missouri River 60 miles south of Nelson and Fresno Reservoir upstream on the Milk can fluctuate 20 feet or more in a season, Nelson rarely loses or gains more than 6 or 8 feet of water elevation.

Not only does that retain water for fish and aquatic organisms, but importantly it doesn't encourage the sort of flushing that defines many run-of-river reservoirs.

"A key to Nelson's productivity is water retention," says Nagel, "the length of time that water stays in the reservoir."

He notes that upstream Fresno Reservoir, the first impoundment on the Milk as it re-enters the United States after meandering through Alberta, turns its water over two to three times per year on average as it's used for downstream purposes. This "flushing" effect means that there's always fresh flow coming into Fresno, which pushes out small fish, aquatic vegetation, and tiny zooplankton that haven't had time to get established.

In contrast, because of its unique storage characteristics, Nelson retains water for up to three years, says Nagel.

"The longer you can retain water in a reservoir, the more you can build productivity, allowing zooplankton to grow and get established and create a nutrient chain that benefits all aquatic organisms," Nagel adds. "Zooplankton and small invertebrates feed juvenile perch and other prey fish, which in turn are eaten by predator species like walleye, and vegetation that becomes established provides security cover for young fish of all species."

CLOCKWISE FROM TOP LEFT: JANET GREENFIELD RACH; CHRIS BOYER; JANET GREENFIELD RACH

ICED PIKE Angler Teddy Jones proudly displays his winter catch from the icy depths of Nelson.

Paul Lambeth of Belgrade with a "leopard pike," a naturally occurring color variation, that he caught out of Nelson Reservoir.

A DIVERSE FISHERY

FWP augments Nelson's naturally reproducing walleye population with annual stocks of about 100,000 hatchery-reared fingerling walleye. Biologists reckon that about a quarter of the reservoir's catchable-sized walleye—15 inches or longer—are from their hatchery stocks, with the remainder either naturally spawned in Nelson or flushed in from upstream.

Young walleye grow fairly quickly in Nelson, reaching that 15-inch mark after about three years. But it takes another three to four years to hit 20 inches. The slowing adult growth is primarily because the forage base is limited to shiners, juvenile perch, and young-of-the-year crappie.

In addition to walleye, species pursued most by anglers include perch and wall-hanger northern pike, black crappie some years, and an increasing number of smallmouth bass.

Those bass have never been stocked in Nelson by FWP. Nagel thinks they drifted in from upstream.

"There were many years when Fresno was producing a lot of northern pike, and during flushing events they were probably flushed down to Nelson," he says. "It's safe to say that's what happened with smallmouth bass. They have been present in a couple reservoirs in the Bear Paw Mountains, and with high-water years and spillway overtopping, they washed down to the Milk River and eventually into Nelson."

Other species that show up in Nelson are magnum channel catfish—the previous state record, a 29.7-pounder, was caught here in 2006—and some very large lake whitefish. The reservoir's native suckers grow to outlandish proportions. The state-record bigmouth buffalo, a tremendous 57.75-pound specimen, was taken from Nelson in 1994. The reservoir also owns the state-record smallmouth buffalo, a 40-pounder, as well as a 40.2-pound common carp.

Carp, which are non-native and considered invasive, and the native buffalo grow large on a diet of Nelson's abundant zooplankton, and are often pursued by bowfishers that target spawners in shallow water in the springtime.

"The ability for buffalo and carp to get

FROM TOP: BRYSON JONES; GENE MCCOMMON

Nelson Reservoir faces some challenges this year, but once the system that feeds it water gets repaired, it should remain the stalwart fishery Montana anglers have enjoyed for generations.

that large is a prime indication of the zooplankton forage base of Nelson," says Nagel. "And for predatory fish, the reservoir has abundant invertebrates and a healthy crayfish forage base."

Burbot, goldeye, shorthead redhorse suckers, sunfish, white suckers, and longnose suckers are also present in Nelson. Forage species include juvenile suckers as well as emerald and spottail shiners, fathead minnows, and native dace, chubs, and silvery minnows.

SURGING POPULARITY

Not only is Nelson a multi-species fishery, it's a multi-season fishery. You're as likely to see a crowd of cold-footers jigging through its ice as you are a flotilla of boaters trolling its open water. According to FWP data, the reservoir typically hosts 15,000 to 25,000 angler days a year. But a longtime Malta walleye angler thinks the pressure is significantly higher than that—and climbing.

"You can't go out there, even in the winter, and not see vehicles from all over Montana and from all our neighboring states, and they're also coming from as far away as Texas and California," says the angler, who fishes Nelson almost daily and asked not to be named because his fishing buddies might crucify him for talking it up to a publication. "That kind of pressure has to hurt fishing. Used to be Nelson was used mainly by the locals, but it's been discovered and I'd observe that it's not as easy to find fish as it used to be."

Trophy-fish photos circulating on social media and the word-of-mouth endorsements of successful anglers have accelerated Nelson's popularity despite its paltry recreation infrastructure. The lake has only one campground—a gravel Bureau of Reclamation site—and two underwhelming boat launches. The wind blows constantly here in every season, though in the summer it's considered a blessing to reduce the intensity of Nelson's legendary mosquitoes.

As much as the angler downplays the virtues of Nelson and stresses its lack of creature comforts, he acknowledges it's a "wonderful resource."

"You have a range of elevations, from shallow water with weeds to 40-foot-deep water with a rocky bottom and structure," he says. "It's not that big, only 4,000 acres or so, so you can fish from one end to the other, maybe twice, in a day. And you can fish it in a wide variety of ways, depending on the season or the species you're after.

"The reality is, it's a resilient fishery, and I just hope it continues," he adds. "I don't blame people for coming, but it's a long way from anywhere, and maybe after a disappointing trip or two they'll stop coming and it can go back to the way it used to be."

DOUBLE-BARREL DELIVERY Built in 1915, the St. Mary Canal added a second tube in 1925 to divert water from the St. Mary River to the Milk.

BLOWN ARTERY The 110-year-old St. Mary Canal Siphon breached near Babb in June 2024, causing more than 300 miles of the Milk River to run low.

BACK IN ACTION The Milk River Project is expected to restore the flow of water to the Milk River by early July, earlier than expected.

REBUILT IN TIME FOR SUMMER

Nelson's resilience was tested as drawdowns during reconstruction of the St. Mary Project diversion extended into the spring. Construction managers expect it to return to service in early July.

"While infrastructure is repaired, we won't be able to divert water," Nagel predicts. "But Nelson is buffered by several major tributaries that come out of the Bear Paws: Big Sandy and Beaver creeks, and both Lodge and Battle creeks that flow out of Canada. Especially if we have good springtime prairie rains, they should help to keep the Milk elevated for several weeks."

In other words, counting on aged infrastructure but hoping for rain. That's a fair description of not only Nelson's fishery but the entire Hi-Line, tested periodically by booms, busts, and unpredictable water.

"Nelson Reservoir faces some challenges this year, but as the system that feeds it water is repaired, it will remain the stalwart fishery Montana anglers have enjoyed for generations," Nagel says.

FROM TOP: MILK RIVER PROJECT; GLACIER COUNTY DES; MILK RIVER PROJECT

FATAL ATTRACTION A male red-naped sapsucker lies dead outside a house after mistaking itself in a picture window reflection for a rival. PHOTO BY PAUL QUENEAU

COLLISION COURSE

Window strikes, dead birds, and what to do about it.

BY SHANE SATER

THE THUD OF A BIRD HITTING GLASS slammed me out of my morning routine. *Not again,* I thought. Hoping I had imagined it, I scurried outside.

The veery lay crumpled on the sidewalk in a soft brown heap. Its black eyes still glistened with life as I gently picked it up and cradled it in my hands, but the bird was listless, stunned, and perhaps concussed, its toes barely grasping as I set it down gently away from the window.

Twenty minutes later, the veery was gone. Perhaps the window had simply stunned it and the bird had flown off. But I knew from a biologist friend of mine, Hilary Turner, that far more birds die from window strikes than just the ones we see. Indeed, a study published last year analyzed wildlife rehabilitation records from more than 3,000 birds (152 different species) injured in building collisions. More than half later died.

Window strikes are a serious problem around the world. In fact, they're second only to domestic cats as the leading cause of preventable, human-caused bird deaths. In the United States, the numbers are chilling and hard to comprehend. Studies have found that glass collisions kill more than one billion birds annually and that houses cause nearly half the deaths, with one- to three-story structures killing 2.1 birds per year on average.

A 2024 study estimated that building collisions kill more than

1 billion birds annually.

A couple of dead birds each year might go unnoticed, especially since predators and scavengers like cats and raccoons may remove carcasses before people find them.

Birder Stephen Turner (Hilary's father) moved into a new house in 2021 a few miles south of Helena in a mature ponderosa pine forest. Its large windows reflected the surrounding woods, creating what Stephen quickly learned was a death trap for local birds, "three to five pine siskins a week," he told me.

Near Bozeman, Lou Ann Harris of Sacajawea Audubon Society estimates the windows of her home killed three to four birds during spring migration each year and a similar number in the fall before she began seeking solutions. "I'd get waxwings, and had a Swainson's thrush kill itself," she said. "I also had a redpoll in the wintertime."

With more than 539,000 housing units in Montana, based on the 2.1 deaths-per-house calculation, our structures kill over 1.1 million birds each year—one for every person living in the state. Fortunately, many of these deaths are preventable with the use of reflection-reducing countermeasures. As research sheds light on window collisions as a major problem for birds, concerned individuals and organizations are developing ways to make windows more bird-friendly.

Shane Sater is a writer and field naturalist in Helena who writes the Wild With Nature *blog and podcast.*

WHEN WORLDS COLLIDE Canadian conservation wildlife photographer and filmmaker **Patricia Homonylo** took this image of 4,000 birds killed by glass and building collisions in and around Toronto, Ontario. During spring and fall migrations when bird strikes are at their peak, rescue patrols head out before sunrise searching city streets for birds that have hit windows. While they save an impressive number of injured birds, many don't survive the impact.

At his home near Helena, Turner installed Acopian BirdSavers—a do-it-yourself solution that involves placing vertical rows of a thin rope known as parachute cord 4 inches apart across the outside of each window. Since installing it, Turner has found evidence of just one window strike in the past two years—a gratifying decrease from his previous estimate of three to five birds per week.

In Bozeman, Harris used a white paint pen to trace vertical stripes 2 inches apart on the outside of her windows, which has also proven effective.

The American Bird Conservancy (ABC) has a list of reflection-reducing options on its website, including commercially sold sticker dots that some western national parks such as Zion have found effective. With all of these methods, the basic goal is to break up the window's reflection from the outside. In general, the ABC recommends using vertical stripes spaced at least 4 inches apart or horizontal stripes spaced 2 inches apart. Note that decals of hawks or other predatory birds are not effective.

"You can do something about it, and it doesn't cost much money. It just takes caring about these wild birds."

There are also a variety of commercial products designed specifically to prevent birds from crashing into windows. Feather Friendly and Solyx Bird Safety Film both use a system of prepared lines or dots, similar to the do-it-yourself options but applied as a tape or a film. CollidEscape, a window coating that appears opaque from the outside, lets light in and provides a relatively clear view out from the inside.

BREAKING THE MIRROR Visual markers that disrupt the solid reflection on the outside of windows can work wonders to limit bird strikes. Placed on the exterior of a window, patterns should cover the whole surface and be high contrast under varying daylight conditions. Decals, tempura paint, insect screens, and beaded curtains are all cost-effective options. For commercial settings, window film can do double-duty as advertising while also protecting birds.

CLOCKWISE FROM TOP LEFT: FLAP CANADA; LEA FRYE; NPS; FLAP CANADA; SHUTTERSTOCK; FLAP CANADA

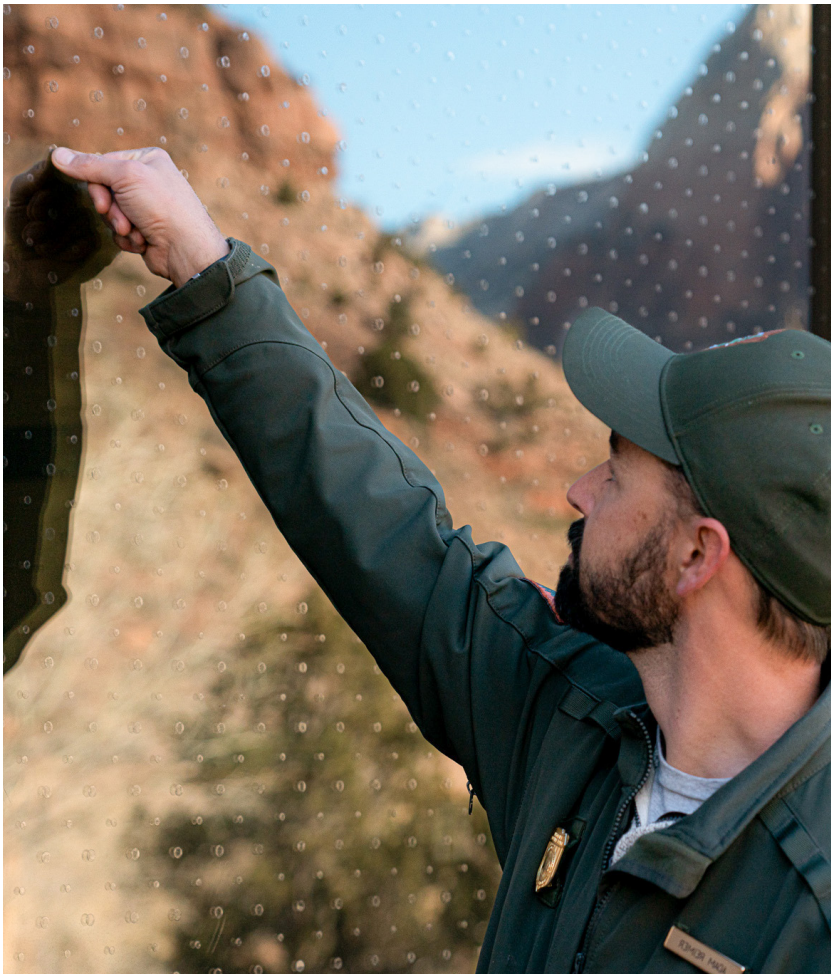
What about the aesthetics? Don't the lines or dots make windows ugly? Opinions vary, of course, but people I've spoken with who have installed these solutions say they still enjoy the view from their windows.

Ruth Swenson installed Acopian BirdSavers on her Helena home, repurposing beaded bamboo curtains for the job.

"Actually, I don't even notice them—they sort of blend in," she reports. "I've had several friends who, when they see them, have commented on how much they like them."

If you need further motivation for making a change for your home, consider the stories behind those window strike victims. The veery that struck the window of my home that late spring morning had just completed a 5,800-mile migration after wintering in the forests of Brazil. As I held that bird's life in my hands that day, the choice seemed clear. It was time to solve the window problem.

Harris sums it up: "You can do something about it, and it doesn't cost much money. It just takes caring about these wild birds."



SPOT CHECK National Park Service scientists are researching ways to reduce bird collisions with park windows. At Zion National Park in Utah, workers installed clear, ultraviolet dot-stickers 2 inches apart that are barely visible to people but that most songbirds can see. Time will tell how well the stickers deter birds, but if successful, they could help pave the way for less-distracting solutions that preserve scenic views.

FROM TOP: ILLUSTRATION BY MIKE MORAN, NPS

What to do with an injured bird

- Don't attempt to catch or trap it.
- Don't touch it with your bare hands. If the bird is in immediate danger, use a paper towel, hand towel, work gloves, t-shirt, or small blanket to carefully pick it up and move it to a safer natural space such as under some brush or a tree. Clean items used for transport.
- If there are no visible injuries, see if the bird can recover on its own. If it's unable to fly away after 24 hours, contact a wildlife rehabilitator for advice on next steps. In the Helena area, call Montana WILD at (406) 444-9942.

For injured raptors, call:

Wild Skies Raptor Center
Potomac
(406) 210-3468

Montana Wild Wings
Kalispell
(406) 250-1070

Montana Raptor Conservation Center
Bozeman
(406) 585-1211

NERVOUS NEWCOMER Justine Trombley (left) told fellow plant surveyors she was terrified of both bears and bugs and rarely ventured outdoors.

Fields of Belonging

How a summer spent surveying mountain meadows brought the outdoors into a young woman's comfort zone.

BY NICO MATALLANA-MEJIA

I started the day with a typical icebreaker: "What is your favorite thing to do outside?" The students answered one by one: "Hiking, fishing, hiking, hiking..."

In the Blackfeet Tribal Nation, most folks spend time outside. But Justine hadn't. When it was her turn, she responded: "I don't like going outside, and actually I avoid it if I can."

I mumbled "Oh, that's okay" and moved on with the meeting. On the inside, though, I was distressed. We were about to spend two months crawling around muggy, buggy meadows on Blackfeet lands east of Glacier National Park. Our project was to survey grassland plant communities, thanks to a research grant from the Montana Native Plant Society, and with help from Blackfeet Community College (BCC) and the National Park Service.

Nico Matallana-Mejia is a PhD candidate in plant ecology at Colorado State University.

The flyer I posted said "Get Paid To Work Outside" in large, bold font. Yet somehow, Justine, a criminal justice major who was visibly uncomfortable outdoors, had applied.

On our first walk to the field site, she fell behind. My trusty technician Heidi Fleury checked in with her and learned Justine had little experience hiking and was terrified of bears. When we made it to our plot, she wouldn't sit down because she was also terrified of bugs. I was sure she would quit by the end of the day.

But she stayed. Day after day, Justine came back even when most of the other students stopped coming. She worked closely with Heidi, an experienced field tech who patiently showed her how to identify each grassland plant species. I remember the first time I heard Justine laugh as she finally began to have fun. At Heidi's side, she transformed from a shy indoor person into a competent botanist cracking jokes and taking pictures of the cute little insects that previously made her skin crawl. Heidi showed her that fieldwork could be a safe space where she could feel comfortable.

With Justine's help, we established a baseline floristic survey of Blackfeet grasslands in preparation for bison reintroduction. Though non-native species dominated most meadows due to a legacy of livestock grazing, we found several strongholds of native species diversity that tribal managers plan to protect and monitor into the future. In addition, we discovered northern wildrye (*Leymus innovatus*), a native species that's rare inside Glacier National Park but quite common in the meadows we surveyed despite being only a few miles from the park boundary. This survey is the beginning of a long-term assessment of the impacts of bison grazing on these plant communities.

MONTANA NATIVE PLANT SOCIETY

PLANT INSPECTORS Grasslands hold almost a third of the diversity of the plant life in and around Glacier National Park. A research team aided by Blackfeet Community College interns placed 20 study plots where bison now once again roam to help understand any changes after grazing.

By the end of the season, Justine told us our field season turned out to be one of the best summer positions she'd ever had, thanks to the supportive environment we fostered. She is now finishing her course-work at Blackfeet Community College and planning to attend Montana State University to pursue a degree in criminal justice. Before that, though, she is considering coming back to work with us this summer.

I hope this story inspires other botanists to join us in helping make our field teams more like our favorite meadows: colorful, diverse, and a place for everyone to feel like they belong.

THE TEAM Surveying native plant communities in the shadow of Chief Mountain (from left to right): Justine Trombley (BCC intern), author Nico Matallana-Mejia (PhD researcher), Ezekial Still Smoking (BCC intern), and Heidi Fleury ("the trusty tech").

Editor's note: Justine returned for another field season and also was accepted at MSU. She started classes as a criminal justice major in August 2024.

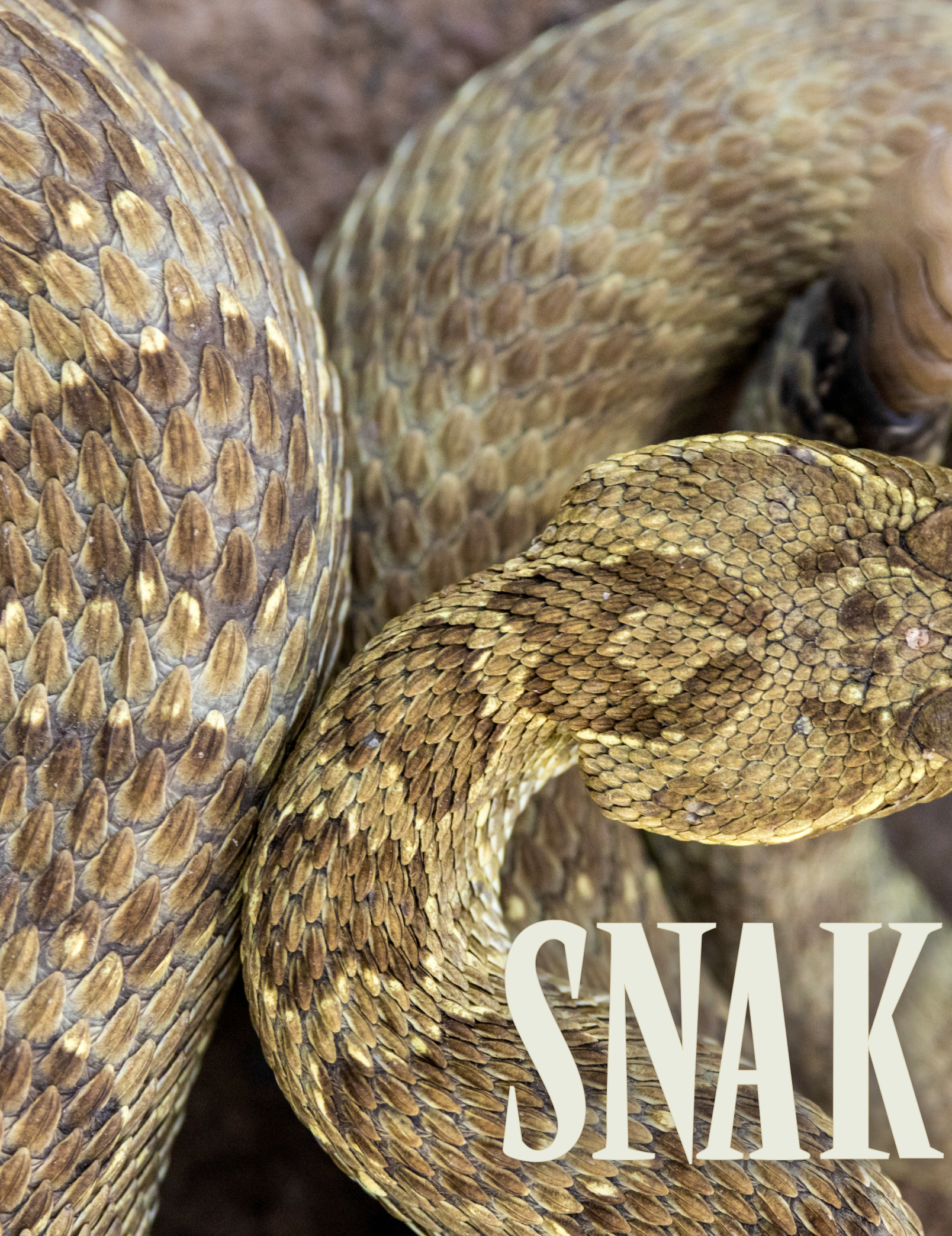
This essay was originally published in the Summer 2024 issue of Kelseya, *the newsletter of the Montana Native Plant Society. Reprinted with permission.*

FROM TOP: GLACIER NATIONAL PARK CONSERVANCY; MONTANA NATIVE PLANT SOCIETY

GRASSLANDS ARE THE MOST THREATENED BIOME IN THE WORLD, storing far more carbon than most landscapes and providing essential forage, wildlife habitat, and aesthetic value.

The uniquely diverse and well-preserved fescue grasslands of northern Montana are now ground zero for the largest bison restoration effort in modern conservation on the Blackfeet Reservation. Building off existing research from Glacier National Park, this project trained Blackfeet Tribal Nation college students in plant survey techniques to establish critical baseline data about plant composition, ecosystem function, and nutrient cycling as bison restoration was about to commence.

Results will inform a landscape-scale model of bison habitat and carrying capacity to help land managers maintain fescue grasslands for biodiversity and ecosystem function. Students also consulted tribal managers and other Indigenous knowledge experts to guide their work from both scientific and cultural angles.


SNAK

EBITE

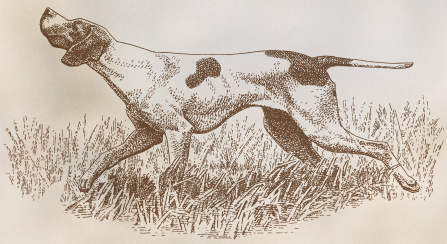
PHOTO BY DON JONES; ILLUSTRATION BY SHUTTERSTOCK

A guide to keeping dogs alive and well in snake country.

BY E. DONNALL THOMAS, JR.

Every upland hunter I know worries about their dogs sustaining a serious or even fatal bite from a venomous snake, especially during the early grouse and partridge season when temperatures are high and snakes are active.

This isn't exclusive to hunters, of course. Anyone who ventures outdoors with their dogs in snake country should take precautions. ▶▶



STEALTHY SERPENT Prairie rattlers can be next to invisible in dry foliage.

Fatal snakebites are like bear attacks, in that we may spend more time worrying about them than their actual frequency suggests we should.

While there are no accurate records about the incidence of fatal snakebites in dogs, there are for humans. Several thousand Americans are bitten every year, but only around five people die as a result, a survival rate that is likely similar for dogs. Of course, if it happens to you or your dog, statistics provide little comfort.

Luckily in Montana we only have one serpent to stress over. The prairie rattler, found statewide except in high mountain areas, is the state's only venomous snake.

Other than coral snakes, all venomous snakes across North America are pit vipers, which have visible sensory pits on their heads that detect heat emitted by their prey. When it strikes, the snake injects venom through its hollow fangs; this venom consists of a mix of proteins so complex that its exact composition remains uncertain.

Early upland bird season is prime time for snake activity.

Toxicity takes two forms. Local swelling around the bite can lead to tissue loss and compromise circulation to an extremity or even the airway if the wound is on or near the face or neck, a potentially fatal complication. As it circulates through a victim's blood stream, venom can also cause cardiovascular collapse, and interference with the body's blood clotting mechanism can lead to serious bleeding.

But back to the good news—snakes don't tend to waste good venom on creatures they don't plan to eat. Around half of snakebites inject no venom at all, resulting in a so-called "dry strike." Like any bite, though, the wound will be contaminated by bacteria and likely require antibiotics, and signs of venom may take hours to manifest. Any known or suspected snakebite should be assumed to have injected venom until proven otherwise by a medical professional. Unless you can positively (and safely) confirm the snake was non-venomous, you'll want to make a rapid trip to the nearest veterinarian.

The proverbial ounce of prevention begins with assessing risk in the area you

Don Thomas, a writer and retired physician of internal medicine in Lewistown, is a longtime contributor to Montana Outdoors.

FROM TOP: DON JONES; LESTER KISH

CANINE COUNTERMEASURES Proper training may save your dog's life if it encounters a snake.

JACK BALLARD

The best way to avoid a snakebite is to enroll your dog in an avoidance clinic led by a skilled and experienced trainer.

plan to visit. Dry, rocky terrain should arouse caution. Also, snakes are not randomly distributed, and in some spots I have encountered an unusual number of snakes during hunting season, suggesting a winter denning site nearby. I don't go back to those areas until temperatures drop and snow covers the ground.

Time of year also matters. Once temperatures begin to top 60 degrees or so in the heat of the day, snakes may be out and about, and the late-summer beginning of Montana's upland bird season in early September is often prime time for snake activity.

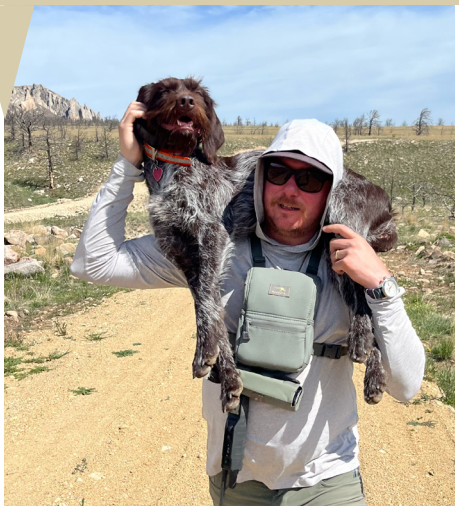
EVASIVE MANEUVERS

The most important preventive measure a dog owner can take to avoid a snakebite is to enroll in a snake avoidance clinic led by a skilled and experienced trainer. I have put all my dogs through one. My favorite was conducted by noted trainer Web Parton in Arizona (a hotbed for snakes where I often hunt quail in December and January). Parton spent a full morning gently conditioning the eight dogs in our class to identify snakes by scent, sight, and sound, and then to avoid them.

During the "final exam," one of my Labs not only recognized Parton's defanged rattler hidden in the grass but actively pushed me away from it. By the end of the session, participants could spot when their dog had detected a snake—added safety in the field.

It is important to note that avoidance clinics can vary considerably in both quality and approach. Most trainers use an e-collar to condition dogs to avoid a snake, which delivers a shock of varying intensity to discourage unwanted behavior. Dog lovers (of which I am one) may balk at the idea of an e-collar, but a properly conducted clinic won't hurt the dog and is far preferable to a snakebite. Parton used them in his class, and I never saw anything more than a mild twitch of the dog's head in response to stimulation. He had a saying that a dog that's hurting isn't learning. But I observed another clinic where an inept trainer shocked the dogs far too hard with the e-collar, which I found revolting.

Before signing up for any clinic, seek opinions from friends or other trusted sources who've attended previously to get their thoughts on the trainer. Good trainers wisely emphasize that no class will remove 100 percent of the risk, but after seeing firsthand the change in dogs' behavior around snakes during and after a clinic, I can't recommend them enough.



LIFE FLIGHT Hiking near the east face of the Beartooths, Andy Moore (above) almost stepped on a coiled rattlesnake. He and his wife quickly hoisted their cherished hunting dogs up on their shoulders for safety, and have since enrolled in snake avoidance training.

SHOT IN THE DARK?

Now for what may be the most controversial topic in this discussion—immunization against snake venom. While it won't prevent bites, it may (or may not) protect a dog from serious consequences. I am a trained physician, and my ambivalence stems from the lack of good scientific data—maybe not surprising since meaningful trials would involve exposing a lot of dogs to snake venom.

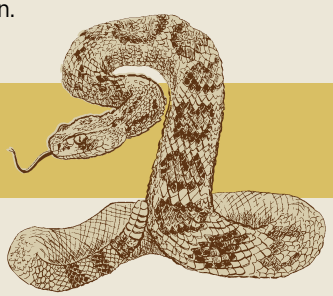
The only previously available vaccine was developed for venom from western diamondbacks, which do not live in Montana. This past May, the sole manufacturer lost its conditional use USDA licensing, so the vaccine was no longer available from veterinarians as this magazine went to press.

Although generally safe, the vaccine can cause allergic reactions. Studies have not so far found it provides adequate protection, and the American Animal Hospital Association released a statement of concern about its effectiveness. With that in mind, I've so far chosen not to vaccinate my dogs.

Yet there is crucial treatment a qualified veterinarian can deliver after a snakebite—antivenin, a biologic agent that neutralizes snake venom. All rattlesnake bites are treated the same way with the same antivenin, but the cost can run into the thousands of dollars depending upon how much is required.

FIRST RESPONSE

Suction devices and other first aid measures once recommended for field treatment have since proven useless or even harmful. As pit viper venom binds rapidly to tissues, suction is ineffective. There is also no good evidence to recommend giving over-the-counter antihistamines by mouth. I would only give antihistamines upon advice of a veterinarian.



Let's imagine a worst-case scenario. You're in the field, your dog yips and paws at a leg, and you spot a prairie rattler nearby. What next? Here's a step-by-step guide.

1. **Keep a close eye out for other snakes**
   You won't be able to give your dog the best care if you are bitten, too.

2. **Check the species of the snake if you can do so safely**
   If you can positively identify the offender as non-venomous, you will have a key piece of information for the vet that may save you expense and inconvenience. Non-venomous bull snakes in particular resemble rattlesnakes and will hiss, shake their tails, and even bite when provoked.

3. **Do your best to calm your dog and keep it still**
   This will help delay absorption of venom.

4. **Avoid moving the bitten extremity as much as possible**
   This may mean carrying the dog out of the field.

5. **Don't waste time trying to perform first aid**
   Your top priority is getting your dog to a qualified veterinarian as soon as possible, even if it appears healthy. A known or suspected bite is an emergency until proven otherwise. If you can, call ahead, give the clinic an ETA, and provide details so they can prepare to treat your dog upon arrival.

FROM TOP: ANDY MOORE; SHUTTERSTOCK; STEVEN AKRE

If you are hunting in a high-risk area, locate the nearest veterinary clinic before going afield and confirm it has antivenin on hand and its staff is trained to treat snakebites. Complications can occur long after a bite, so if you do end up at the vet, don't be surprised if they recommend keeping your dog under observation even if it appears well to you.

Your best bet, of course, is to avoid the need for treatment in the first place. Long before you go afield, get prepared by ensuring your dog is trained to avoid snakes (which helps you avoid snakes, too). And if disaster does strike, have a game plan for how and where to get your canine companion swiftly to a veterinary professional.

SNAKE SURVIVOR After a rattler bit Matthew Bertellotti's hunting dog Willow, he backpacked him out of the Block Management Area and drove to an emergency vet in Lewistown for treatment. "It was the opener of pheasant season, so they had plenty of antivenin on hand."

PRUDENT POINTER Trainer Webb Parton uses a defanged rattler to help teach a dog to spot snakes by scent, sight, and sound—then avoid them.

CLOCKWISE FROM TOP LEFT: MATTHEW BERTELLOTTI; DON JONES; KEITH CROWLEY

Stream Savers

For 50 years, Montana's "310" permits have helped riparian homeowners and others protect the state's most valuable aquatic assets.

BY TOM DICKSON

RIVER RICHES **Streams and rivers, like the West Gallatin River near Gallatin Gateway, are treasured for their water, beauty, fish, and wildlife—and prime real estate values.** PHOTO BY CHRIS BOYER

GLACIAL LOOPHOLE A house built mere feet from McDonald Creek slipped past permitting because it rests on a private inholding inside Glacier National Park.

> "Nothing we do does more to protect trout habitat than reviewing 310 permits."

In 2022, a California couple began building a three-story house on the banks of McDonald Creek in Glacier National Park. The structure, in plain sight of park visitors, sits on a tiny 0.05-acre lot the couple owns that was grandfathered into the park at its creation in 1910. Construction of the house, which rests on a retaining wall and rock footings built into the McDonald Creek streambank, was halted by the Flathead Conservation District board of supervisors because the couple had not obtained a Montana 310 permit.

But in early 2025, a federal judge ruled that construction could proceed, stating that the state law had no jurisdiction within the federal park's boundary. The conservation district and a group of local residents recently appealed the ruling.

When local newspapers broke the story, the biggest question many readers may have had (in addition to why anyone would want to build a house in a national park) is, "What's a 310 permit?"

The state law creating Montana's 310 permit celebrates its 50th anniversary this year. Passed when the Treasure State was a national leader in stream protection, the law was written to reduce harm to streams caused by home and other construction on and near banks. Administered by conservation districts, the permitting process provides opportunities for Montana Fish, Wildlife & Parks biologists to recommend how private developments can be revised to protect stream and riverbank fish and wildlife habitat.

"Nothing we do does more to protect trout habitat than reviewing 310 permits," says Ladd Knotek, FWP fisheries biologist in Missoula. "It's been state law for half a century, but almost no one knows about it and all the good it does."

JAYCEES STEP UP

Protecting streams was a low priority for most people when Montana was first being developed in the late 19th century. Rivers were used mainly for irrigating crops, floating logs downstream to mills, powering mills, and dumping industrial and municipal waste. Creek meanders were eliminated whenever possible. A DuPont ad titled "How Dynamite Streamlines Streams" in a 1935 issue of *American Forests* called serpentine streams "a menace to life and crops in the area bordering on their banks."

But by the 1950s, trout anglers and other stream advocates began raising concerns as fish numbers plummeted in rivers degraded by highway and bridge construction, channelization, and water pollution. In 1961, fisheries officials with the Montana Department of Fish and Game responded by collecting data documenting stream damage from road and other development. Biologists compared fish numbers in altered and unaltered stretches of 13 streams in western and central Montana. They measured streambed and bank "improvements" like channelization (stream straightening), riprapping (adding rocks or other hard debris to banks), and removing underwater habitat such as logs and gravel. Then they compared trout numbers before and after the alterations. The findings were alarming.

Overall, biologists counted more than three times as many catchable trout in natural stretches than they did in altered channels. On Rock Creek, near Red Lodge, trout numbers declined 75 percent after channelization. After a section of Flint Creek near Philipsburg was channelized in 1957, the number of large trout declined by two-thirds. Protecting small tributary streams is especially important because that's where many trout in large streams and rivers reproduce.

In early 1963, the department presented its findings to civic groups, including the Montana Junior Chamber of Commerce (Jaycees). Concerned about economic loss in local communities from trout stream and river damage, the Jaycees and other organizations successfully lobbied the Montana Legislature to pass what became known as the Montana Stream Protection Act. The 1963 law required state agencies, counties, and public municipalities to apply for a "124 permit," named after the bill number and administered by Fish and Game, for highway construction and other public projects that would modify or change the natural shape of a stream or its banks.

Though written to sunset after two years, it was one of the first stream protection laws in the nation.

THE PRIVATE PROBLEM

Despite their success, trout and river advocates knew that mandating review of govern-

HUNGRY HORSE NEWS

Tom Dickson was the Montana Outdoors *editor from 2001 to 2024. He lives in Helena.*

August, 1935 AMERICAN FORESTS 385

How DYNAMITE streamlines streams

NEW CHANNEL

Straightening of Pequest River in New Jersey by CCC workers stopped its yearly floods. Location of new channel is seen at right. Note temporary dam at left to provide volume of water for scouring blasted channel.

Explosion of dynamite charge by propagation excavates new channel.

Immediately after explosion, water is entering new channel, whose banks will be smoothed and "stream-lined" by the speedier flow of water.

CROOKED STREAMS are a menace to life and crops in the areas bordering on their banks. The twisting and turning of the channel retards the flow and reduces the capacity of the stream to handle large volumes of water. Floods result. Crops are ruined. Lives are lost. Banks are undermined, causing cave-ins that steal valuable acreage.

In many instances straightening out a stream has doubled its capacity for disposing of run-off water.

DYNAMITE may be used most efficiently and economically in taking the kinks out of a crooked stream. The dynamite is loaded along the length of "cut-off" channel. When fired, the dirt and other debris is heaved high in the air and is scattered over the adjoining territory—leaving practically no spoil-banks. In addition to the material actually thrown out, much dirt is loosened and is later scoured out by the water which rushes swiftly through the straightened channel.

Du Pont Dynamite has straightened many thousands of miles of crooked streams. Du Pont engineers have worked for years to develop the best blasting methods for the cleaning out and straightening of streams. All their data is in a 48-page book, "Ditching with Dynamite." It is for your use. Write for it.

Dynamite can help you do other jobs, too. It can help you build highways, dams; fight soil erosion; work quarries. Du Pont has an explosive for every purpose.

DU PONT

E. I. du Pont de Nemours & Co. Inc.
Explosives Department
6107 du Pont Building
Wilmington, Del.

When Writing Advertisers—Mention AMERICAN FORESTS

DETROIT RIPRAP A relic of 1950s erosion-control experiments, embedding car bodies into the banks of streams and rivers was once a common practice in Montana, as was using dynamite (see ad at left) to straighten out the "menace" of serpentine streams.

ment road projects wasn't enough to protect streams. Streamside housing development and other activities on private land also required review and permitting.

But if there's one thing Montanans treasure as much as streams and trout, it's private property rights. Though the Legislature made the 124 law permanent in 1965, it would be another decade before enough support could be found to pass a bill addressing activities on private land.

During that time, state fisheries crews continued to document stream damage. In a 1974 *Montana Outdoors* article, biologists reported that after examining 160 miles of the Beaver, Lolo, and Rock creeks and Big Hole, Jefferson, and Ruby rivers, they found that 24 miles (15 percent) of channels had been altered by bulldozers or draglines, mainly by private landowners. Commenting on the findings a few months later in *The River Rat,* the newsletter of the Butte Chapter of Trout Unlimited, editor George F. Grant wrote, "It is difficult to understand how a state that professes such pride in its trout streams can treat them so badly."

The sticking points were administration and enforcement: Many lawmakers balked at granting Fish and Game veto power over private developments.

But over the next year, legislators worked out a compromise. Locally elected boards of supervisors of the state's 58 county soil and water conservation districts (now called conservation districts) would supervise streamside construction permits on private land, with Game and Fish serving in an advising role and the Montana Department of Natural Resources and Conservation overseeing the statewide program. Passed in 1975, the Natural Streambed and Land Preservation Act required property owners to obtain a 310 permit, also named after the bill number, before doing any work that "physically alters or modifies the bed or immediate banks of a perennial-flowing stream."

The statewide 310 permitting process differs from local stream setbacks, established in later years. First drawn up by Chouteau County in 1985, setbacks are imposed by some local governments as part of subdivision regulations or zoning to restrict houses and other structures from being built within a set distance from certain streams or rivers.

HARD LESSONS After a landowner straightened a section of Big Spring Creek near Lewistown in the 1960s, the increased water velocity caused severe erosion both up- and downstream, widening the channel from 28 to 148 feet over the next decade. The harm to the trout fishery helped launch a movement to protect streams statewide.

The Stream Protection Act took root in the early '60s after biologists counted **more than three times as many catchable trout in natural stretches** as they did in altered channels.

CLOCKWISE: AMERICAN FORESTS; JEREMIE HOLLMAN; MONTANA OUTDOORS ARCHIVE (DICK BALDES/ F&G)

Conservation districts anchor soil, water

Lewis & Clark Conservation District

Following the Dust Bowl of the 1930s, county conservation districts were established nationwide to help farmers and landowners reduce erosion and retain water. Conservation district boards are composed of locally elected volunteer supervisors, are not part of county governments, and maintain autonomy beyond city, county, and state oversight.

"The beauty of having conservation districts administer 310 permits is that the supervisors are local people who are concerned about the resource but realistic about what can work," says Chris Evans, administrator of the Lewis & Clark Conservation District. "Their kids go to the same schools as the people they are permitting; they all go to the same grocery store. There's a lot of mutual respect."

In addition to administering 310 permits, conservation districts help landowners and communities on projects like installing culverts and bridges, stabilizing banks, planting riparian buffers and pollinator habitat, and controlling weeds. Some even help pay for planting vegetation along streams or fencing cattle away from banks and provide grants to teachers and students for natural resource education.

Madison Conservation District

Lewis & Clark Conservation District

Beaverhead Conservation District

Gallatin Conservation District

> "We're right there to answer questions on every aspect of the application."

SIMPLE PROCESS

A wide range of projects can damage streams and banks: modifying an irrigation diversion headgate, building a house, dredging, removing trees or other vegetation, installing a culvert or bridge, or even attempting to stabilize banks. So, too, can constructing a boat ramp or dock on rivers and reservoirs.

Under the 310 law, a landowner or their representative proposing a project fills out a permit application online or in a conservation district office. The 10-page form—which includes applications for other requirements like an FWP 124 and county and federal floodplain permits—asks for a description of the project, timeline, location, project goal, and other information. "We're right there to answer questions on every aspect of the application," says Radley Watkins, executive director of the Missoula Conservation District.

Samantha Tappenbeck, resource conservationist with the Flathead Conservation District, says the next step is for a conservation district supervisor to visit the site with an FWP fisheries or wildlife biologist and the property owner. "This is where we have a conversation about their goals, which may be to better access the stream or putting in a culvert or bridge so they can cross it," she says. FWP and conservation district representatives assess how the project might increase erosion or sedimentation, contaminate water, damage fish habitat, reduce flow, or increase invasive weeds. "Then we recommend modifications that reduce problems to the stream while still meeting the landowner's goals," Tappenbeck says.

Each month, a conservation district's

JOINT EFFORT A representative from the Lower Musselshell Conservation District speaks with landowners and other stakeholders. Conservation districts help with projects like installing culverts and bridges, stabilizing banks, planting riparian buffers and pollinator habitat, and controlling weeds.

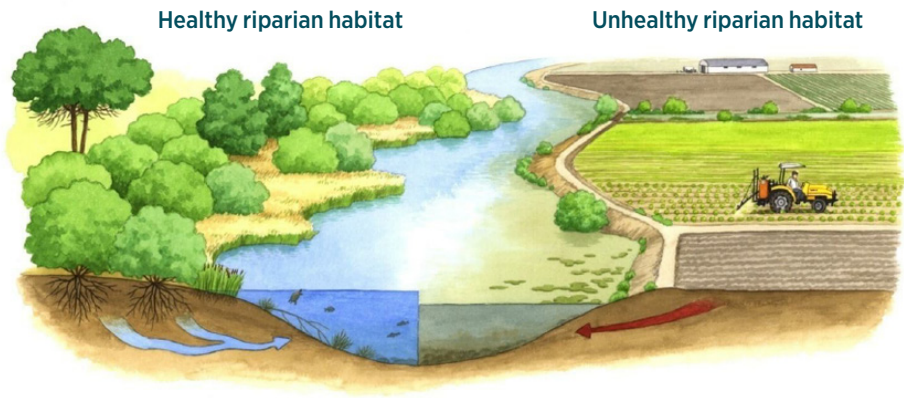
all-volunteer, publicly elected board of supervisors reviews and discusses 310 applications and either approves the permits as proposed, approves them with modifications, or, in rare cases, rejects them. The process takes two to 12 weeks, depending on the conservation district (those in less populous counties may have few or no paid staff to process applications). The free permits are good for one year to complete a project.

Because the law grants broad authority, conservation districts have discretion on how it is applied to stream projects. "That flexibility means 310 permitting can be adapted to local economies and conditions," says Jason Garber, who was the DNRC's stream permitting coordinator before becoming FWP's SPA 124 manager in 2024.

Contractors often fill out 310 permit applications on behalf of their clients. Malcolm Miller, with Treasure State Tree Service in Missoula, says he didn't know about permits when he started his business in the early 2000s. "We removed a dead cottonwood for a homeowner along Rattlesnake Creek, and a neighbor must have called the conservation district," he says. "A few days later we got a letter telling us that next time we needed to apply for a permit, and we've done that ever since. It's not a hassle at all."

Miller says sometimes after talking to FWP staff, his clients agree to retaining part of a standing dead tree trunk as habitat for woodpeckers, owls, and other wildlife. "Or the biologist might recommend not doing anything with a downed tree that's in the water because it can make habitat for fish and add nutrients to the water."

Watkins in Missoula notes that eroding banks are a major concern for property owners on rivers. "But instead of having them dump concrete on the bank, which many people think is the solution, we'll promote planting trees and woody shrubs like native willows. That creates long-term bank stability while providing wildlife habitat."



CREATING CONSERVATIONISTS

The 310 law includes penalties, though they are almost never imposed. Streamside projects done without a permit or outside a permit's scope can incur fines of $500 per day up to $15,000 total. But fines are rare, Watkins says: "If someone chops down some trees without a permit, our board might require that they plant new trees."

Chris Evans, administrator of the Lewis & Clark Conservation District, says 310 permitting in her district focuses mostly on education. "For instance, a lot of people on Canyon Ferry, Hauser, and Holter [reservoirs] want their lawns to go right down to the lake so they can see the water," she says. "We explain that by removing all that brush along the banks, they could contribute to erosion and eliminate wildlife and fish habitat. They tell us, 'Wow, we had no idea.'"

Many homeowners also have no idea that Montana even has stream protection laws, Watkins says. "Many states don't, so when people move here, they don't have a clue." In 2023, he and several other conservation district officials worked with the Montana Association of Realtors, which agreed to mention 310 permit requirements on buy-sell agreements. "Now it's right there in the contract for people when they buy a new home so they can be aware of Montana's strong conservation ethic," Watkins says.

Conservation districts also explain how land beyond the stream and bank also needs to be kept in a natural state. "The name of the law is Streambed *and Land* Preservation," says Watkins. "It states that 'rivers and streams and the lands and property immediately adjacent to them within the state are to be protected and preserved.' Legislators understood that development some distance away from the water can still harm streams, like by increasing siltation and removing filtering vegetation."

FROM TOP: LOWER MUSSELSHELL CONSERVATION DISTRICT; ANDRÉ FABIÃO

DOING RIGHT BY THE RIVER (clockwise from top left) Landowners play a critical role in keeping streams healthy by maintaining buffers of trees, willows, and other natural foliage; leaving downed trees, log jams, and other woody debris to help create and sustain good fish habitat; and erecting fences that keep out livestock.

“Restoring a single mile of stream can cost hundreds of thousands of dollars and take several years. We can review a 310 permit application, do a site visit, and make recommendations in one week.”

OUNCE OF PREVENTION

Stream habitat protection, including 310 permitting, is the counterpart to stream habitat restoration, says Pat Saffel, FWP regional fisheries manager in Missoula. With restoration, FWP and conservation groups work with landowners to repair past damage.

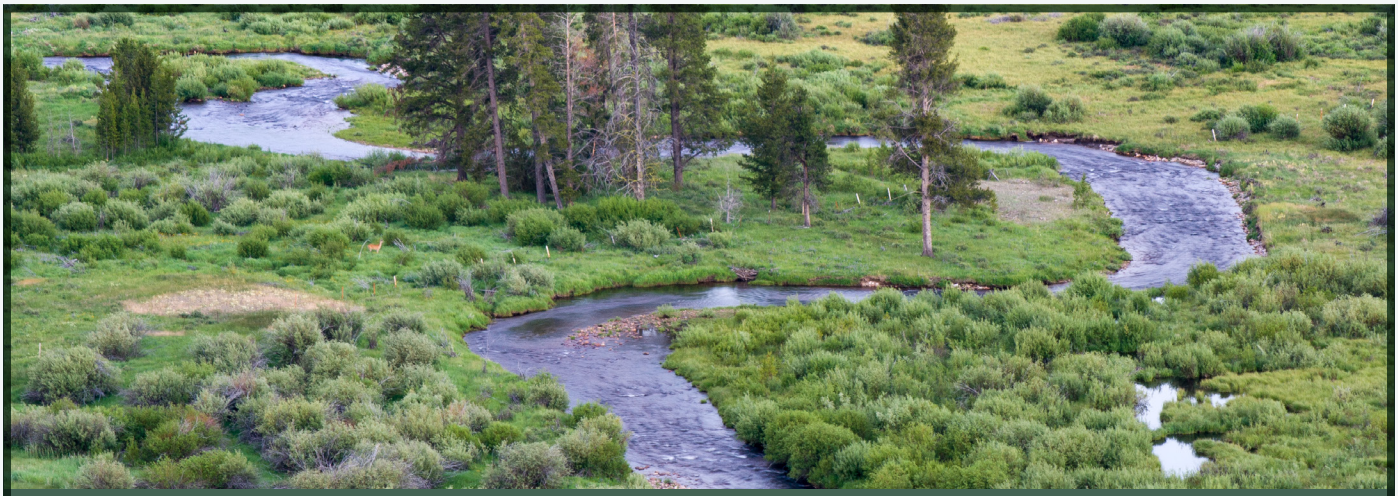
“We’ll bring in people and machinery to reshape a straightened channel, deepen pools, and plant riparian vegetation,” he says. “People love these projects because they see the before and after with their own eyes.”

Preventing damage from happening in the first place with a 310 permit is less visible and far less well known. But Saffel, Knotek, and other biologists say that FWP protects more stream miles each year through the permitting process than the agency is able to restore. “Restoring a single mile of stream can cost hundreds of thousands of dollars and take several years,” Knotek says. “We can review a 310 permit application, do a site visit, and make recommendations in one week.”

Though the Glacier National Park home builders have so far avoided 310 permitting due to a legal loophole, the law ensures that similar construction doesn’t damage Montana’s other streams. Saffel notes that as development along and near streams and rivers continues to boom, Montanans might consider taking a moment in 2025 to celebrate the 1975 legislation’s golden anniversary.

“In Montana, the streambeds and banks are privately owned, but the water, fish, and wildlife are public,” he says. “The 310 law is a means of having a conversation about how to reduce or eliminate the harm of private actions to those public resources.”

CLOCKWISE FROM TOP LEFT: WIKIMEDIA; LADD KNOTEK / FWP; NORTHERN NECK MASTER GARDENERS; USDA; HANNAH NIKONOW



What a healthy stream needs

A stream requires more than just water and a channel to support trout and other aquatic life. It needs to have enough water, and that water must be clean. It also needs banks and surrounding lands that are anchored in brush, trees, and tall grasses.

Bottom gravel washed clean of silt by spring floods allows trout eggs and insects like mayflies to survive. As a stream winds its way across the landscape, the series of twists and turns create shallow riffles for spawning and insect production, followed by deep pools and undercut banks where fish find shade from the hot summer sun and avoid ospreys and other predators. Underwater logs and boulders break the current, giving trout places to wait with less effort for aquatic insects and other foods to flow past.

The serpentine nature of streams also allows floodwaters to spill over the banks in spring, slowing the force of the water and bringing silt up into the flooded plain, where it adds soil and fosters growth of seedling cottonwoods. If streams are diked or lined with rock—"riprapped"—to isolate them from their floodplain, rising waters flow faster and faster, eroding banks farther downstream.

Willows and other shrubs secure the banks and keep them from sloughing away. Live cottonwoods and other tall trees provide shade, then when they grow old and topple into the water, add fish habitat and nutrients (from decaying wood). Farther from the stream, tall grasses and wetlands filter sediment, road runoff, and lawn fertilizer washing in from surrounding areas, helping to keep the water clean.

A stream or river lined with natural vegetation is great for wildlife, too. Woodpeckers, raptors, and other birds nest and perch in streamside trees and shrubs. Mink, muskrats, and otters live along the banks. Herons wade the shallows, feeding on small fish. Deer and other wildlife find cooling shade, hiding areas, lush food, and water wherever healthy streams flow.

FROM TOP: DEE LINNELL BLANK; ERIC ENGBRETSON; RANDY SMITH; DON JONES

Big Sky Season

Summer is mating season between earth and sky across Montana.

Days that begin as a cloudless blue canvas become flecked with cotton, lanky wisps that rise and thicken by the hour.

As the sun passes its zenith, moist air surges up from the ground to supercharge some of these clouds into anvil Goliaths that may grow to twice the height of Everest.

Soon they pelt the ground below with rain, wind, and sometimes hail. The churn of icy molecules within the cloud creates static charges searching for a spot to conduct a billion-watt bolt. In an instant, lightning heats the air around it five times hotter than the sun's surface, sending a shock wave of thunder that can be heard up to 10 miles away.

Montana's atmosphere generates more than 3 million bolts of lightning in a given year, yet most thunderstorms last just half an hour, shorter lived than a mayfly, each as unique and distinctive as a fingerprint.

We all carry with us that one storm, that one strike, emblazoned in our memory. Here is a selection of photos celebrating this season of electric weather across the Big Sky.

—Paul Queneau

A thunderstorm over canola fields near Whitefish. Photo by Robert Kelly.

ERIN BRAATEN **Positive ground strike near Kalispell.**

LESLEYANNE RYAN Lightning splitting curtains of rain near Lewistown.

SEAN HEAVEY High voltage west of Glendive.

SEAN HEAVEY **A supercell thunderstorm** southwest of Capitol that produced 70-mph winds and 2-inch hail.

JOHN FECTEAU Post-storm rainbow near Reed Point.

SEAN HEAVEY Crepuscular rays paint the sky at sunset after a storm near Glasgow.

ROLAND TAYLOR **Mammatus clouds over Giant Springs.**

Give me a lift?

By Tom Dickson

Every year about now I do something people consider odd. After putting in at the Wolf Creek Bridge on the Missouri River and fishing the mayfly hatch for several hours, I park my canoe on the bank at the Craig Fishing Access Site, walk a quarter-mile to the riverside road, and stick out my thumb.

I've been hitchhiking on and off for half a century. I got my first ride at age 15, hitching with three friends from western Wisconsin back to our neighborhood in St. Paul. Throughout college I hitched all over the United States, and in my 20s I bummed rides in parts of Europe, Zimbabwe, Botswana, and South Africa. For three months one fall I hitchhiked throughout England and Scotland, fishing along the way.

I couldn't afford other means of travel. My first few cars were rust-buckets that could hardly transport me across town, much less cross-country. Occasionally I'd take a Greyhound, but usually I preferred to have my mom or a buddy drive me to the outskirts of the Twin Cities and let me off with my rucksack and a cardboard sign.

Another reason for hitchhiking was to reaffirm my faith in human decency. Each time I stood along a highway with my thumb out, I knew from experience that eventually someone would pull over to pick me up, and that I'd likely piece together enough separate rides that day to reach my destination (rarely does just one lift get you where you want to go). Sure, some drivers were a bit dodgy, but in all those years I never felt in real danger. I was picked up by moms, couples, single women, and even entire families, me squeezing in next to the kids in the back seat.

Usually it was a guy on his own, stopping for some company on a long, tiring drive or out of sympathy for a fellow traveler.

That's why I still pick up hitchhikers. I've received so many rides over the years that I feel a need to pay it back, even though it's rare to see a roadside rambler these days. I guess high school and college students all have their own cars or trucks, and vehicles in general are more reliable than my '72 Chevy Vega was back then. Usually what I encounter is some dude down on his luck, like the older guy I picked up last summer outside Townsend when I was driving home from Bozeman.

He was pretty scraggly, with a dust-covered pack and strands of gray hair sticking out from under a beaten baseball cap. He hobbled up to the car and climbed in. I could hardly understand what he said but eventually figured out that he'd had a stroke a few years back, making it tough to talk and walk. His name was Dale or Dave. He was returning from the Bakken region of northwestern North Dakota, where he'd gone to find work but hadn't had any luck.

"That's a long way."

"Yep. I'm pretty worn out. Thanks for the ride."

I dropped him off at the God's Love homeless shelter in Helena and handed him a twenty. It was late, so I waited to make sure he could get inside before I drove off.

My wife would prefer I didn't hitchhike or pick up hitchhikers (I never do it when we drive together). But for me, spending time in a vehicle with a complete stranger—as the driver or the passenger—reinforces my belief in the innate goodness of humankind unlike any other experience I've had. Picking up a hitchhiker doesn't help make the world a better place in any grand way. But it's something.

If you're ever in Craig during the mayfly hatch and see a lanky, slope-shouldered fellow with a canoe paddle in one hand and his thumb sticking out from the other, consider giving me a ride back to my car. It might do us both some good.

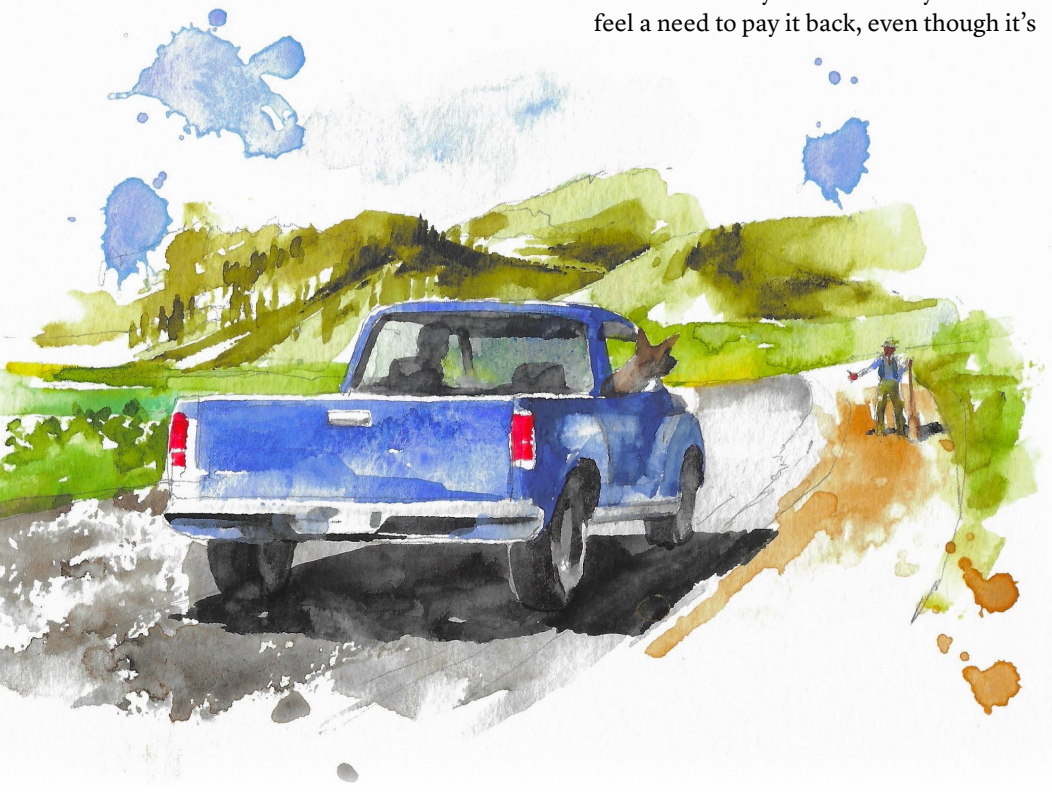


ILLUSTRATION BY STAN FELLOWS

Tom Dickson is the previous editor of Montana Outdoors.

Io moth

Automeris io

By Paul Queneau

Scrambling up a slot canyon on a week-long canoeing adventure in the Upper Missouri River Breaks, our group was suddenly stricken by itchy welts, all on our right thighs.

A dab of cortisone cream eased the pain but not the burning question of what got us. We retraced our path searching for stinging nettles or poison ivy, then spotted the camouflaged culprit clinging to thigh-height foliage: a monstrous caterpillar looking like a Vienna sausage crossbred with a cactus.

Two inches long, finger-fat, and candy-apple green with a red-and-white racing stripe, it bristled with black-tipped spines primed with venom. I'd later come to learn this mean bugger was on the cusp of a Cinderella transformation. Within days it would form a cocoon and metamorphose into one of the prettiest silk moths in Montana, the Io (pronounced eye-oh).

NAME

This moth gets its title from the mythological Greek goddess Io, first priestess of Hera and wife of Zeus, god of thunder and lightning and king of gods and men (fitting for a caterpillar not to be trifled with).

PREDATORS

Thanks to their spiky defenses, Io moth larvae are well-protected from predators, which include birds, mammals, spiders, and insects. Hornets commonly attack Io moth larvae, presumably out of pure jealousy of that extraordinary endowment of stingers. Yet once an Io becomes a moth, its only defense is a bit of visual trickery.

Paul Queneau is the Montana Outdoors *editor.*

SHUTTERSTOCK

SAUSAGE WITH SPIKES One of the few stinging caterpillars native to Montana, the Io packs a cactus-load of spines.

IDENTIFICATION

Butterfly-like in its moth stage, the Io's most distinctive feature is the dark blue or black eyespots on its yellow hindwings. Males flaunt bright yellow forewings, body, and legs, while females trend reddish-brown.

"With those eyespots, they're unmistakable, and so pretty they're almost poetic," says Marian Kirst, an entomologist with the Montana Moth Project. "The eyespots are a steel blue that fades to aqua with an incredible white starburst to resemble the eye-glint of a large predator. That way they look very scary to anything that might want to eat them."

LIFE CYCLE

The Io's moth stage is short but essential. Lacking a mouth or digestive system, it exists only to reproduce. On a warm day in late spring, Ios break free of their cocoons in late morning or early afternoon and remain still until evening. Between 9:30 p.m. and midnight, females begin to release a pheromone to draw in males.

They mate after a day or two of courting, then females lay eggs attached to leaves and die soon after. A little over a week later, baby Ios begin to hatch, forming a conga-line of spiky red larvae that follow a silk trail laid by the lead caterpillar to a prime feeding spot on the host plant. There they molt and eventually grow into the menacing green sausages with spikes that we encountered, primed and ready to fend off anything from birds to Boy Scouts.

They eventually descend from their host plants to spin cocoons and overwinter in leaf litter or crevices, where they survive the subzero temperatures of winter thanks to antifreeze chemicals in their blood.

RANGE AND HABITAT

Ios are mostly found east of the Continental Divide in Montana, with a range that spans to the Atlantic and south all the way to Panama.

Host plants for the larvae include oak, willow, hackberry, currant, and various wild cherries. The one I met up with in the Upper Missouri Breaks clung to wild licorice.

CONSERVATION STATUS

Kirst says the Io's population trend in the state is tough to gauge without additional research, and a great example of what the Montana Moth Project (see "Discoveries in Darkness: Searching for Montana's beautiful, mysterious moths," November-December 2024) seeks to uncover. "It's one of our mascot moths," she says. "My volunteers and I are always thrilled to find it."

THE **OUTSIDE** IS IN US ALL.

Whether you're fishing, camping, skiing, mountain biking, boating, hiking, wildlife watching, or **catching a big one on the Missouri River,** Montana is a place where everyone can find their own way to connect with the natural world. Around here, **the outside is in us all.** PHOTO BY JESS MCGLOTHLIN

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